

REMARKS/ARGUMENTS

Claims 21, 54, 55, and 60-78 are pending in the present application, with claims 21, 60, 61, 76 and 78 being independent.

The Examiner has rejected claims 74 and 75 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement, as claiming subject matter not described in the specification in a way as to enable one skilled in the art to make and/or use the invention.

The Examiner has further rejected claim 60 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant claims as the invention.

The Examiner has rejected claim 78 under 35 U.S.C. §102(e) as being anticipated by US Patent No. 6,503,404 ("Ghalib").

The Examiner has rejected pending claim 60 under 35 U.S.C. §103(a) as being obvious over Ghalib. Furthermore, the Examiner has rejected pending claims 21, 54, 61-64, 66-69 and 71-73 under 35 U.S.C. §103(a) as being obvious over Ghalib in view of US Patent No. 5,980,736 ("Putz"). The Examiner has further rejected claims 76 and 77 under 35 U.S.C. §103(a) as being obvious over Putz in view of US Patent No. 4,659,459 ("O'Leary"). The Examiner has further rejected claims 55 and 70 under 35 U.S.C. §103(a) as being obvious over Ghalib in view of Putz and applied to claims 21 and 61, and in view of O'Leary. Finally, the Examiner has rejected claim 65 under 35 U.S.C. §103(a) as being obvious over Ghalib in view of Putz and further in view of US Patent Publication No. 2003/0030011 ("Brown")

Applicant has herein amended claims 21, 54, 55, 61, 67, 68, 76, and 77. Applicant also requests the cancellation of claims 60, 62, 63, 74, 75, and 78 without prejudice. For at least the reasons stated herein, Applicant asserts that the claims as presented are patentable over the cited prior art and are therefore in condition for allowance.

Claim Rejections under 35 U.S.C. §112

The Examiner has rejected claims 74 and 75 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement, as claiming subject matter not described in the specification in a way as to enable one skilled in the art to make and/or use the invention.

Applicant has cancelled claims 74 and 75, rendering the Examiner's rejection moot.

The Examiner has further rejected pending claim 60 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant claims as the invention.

Applicant has cancelled claim 60, rendering the Examiner's rejection moot.

Claim Rejections under 35 U.S.C. §102(b)

The Examiner has rejected claim 78 under 35 U.S.C. §102(e) as being anticipated by US Patent No. 6,503,404 ("Ghalib").

Applicant has cancelled claim 78, rendering the Examiner's rejection moot. Other applications of Ghalib as prior art are addressed below.

Claim Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected pending claim 60 under 35 U.S.C. §103(a) as being obvious over Ghalib. Applicant has cancelled claim 60, rendering the Examiner's rejection as to that claim moot.

Claims 21, 61 and their dependent claims

Furthermore, the Examiner has rejected pending claims 21, 54, 61-64, 66-69 and 71-73 under 35 U.S.C. §103(a) as being obvious over Ghalib in view of US Patent No. 5,980,736 ("Putz").

Applicant has cancelled claim 62, 63, rendering the Examiner's rejection moot as to those claims. Applicant has amended claims 21, 54, 61, 67, and 68, rendering those rejections moot as well. However, in an effort to further the application to issuance, Applicant addresses the Examiner's citations as to Ghalib and Putz. Applicant asserts the neither Ghalib nor Putz, individually or combined, teaches, suggests or motivates independent claims 21 and 61, for at least the following reasons:

In section 5 of the 3/13/08 Office Action, the Examiner cites Ghalib as teaching most elements of the independent claim 21. Applicant herein asserts that Ghalib is non-analogous art,

for at least the following reasons. Applicant hereby requests that the Examiner consider to the content of "The Use of Dry Weather Storm Drain Diversion in California, Diverted by Diversion," ("Wilson") submitted in an Information Disclosure Statement filed herewith. This document, as one example, teaches the fundamental difference between *Municipal Separate Storm Sewer System* (MS4-type) stormwater management infrastructures and that of *Combined Sewer Overflow* (CSO-type) systems. At the risk of over simplifying, CSO-type systems mix municipal wastewater (runoff) and sewage into one system, while MS4-type sewer systems are conveyances separate from the sewer system for taking runoff to a receiving body of water (an ocean or river.) During wet weather events (rainstorms) CSO-type systems may be overwhelmed and experience overflow and/or backflow. The present CSO solution is to divert the overflow directly to the receiving body of water untreated. MS4-type sewer systems are well known and understood by those of ordinary skill in the art, and are defined by the EPA as:

Municipal separate storm sewer means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;
- (ii) designed or used for collecting or conveying storm water;
- (iii) *which is not a combined sewer*; and
- (iv) which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 C.F.R. §122.2.

40 C.F.R. §122.26 (b)(8) (emphasis added.)

As the Examiner will note, CSO-type systems are expressly excluded from the definition of MS4 sewer systems by definition. MS4-type sewer systems are also distinguished from CSO-type systems in at least [0004]. (Please note: paragraph references in [] are to the published specification, US 2004/0154965 Baum, unless otherwise indicated.)

Applicant further requests that the Examiner consider Applicant's assertion that Ghalib teaches a wet weather diversion system (CSO-type), not comparable or analogous to the wet-and-dry-weather water disinfection system of the invention as claimed, which is claimed for use in MS4-type sewers. These two types of sewer systems provide completely different solutions to

the problems of increased demand placed on stormwater management infrastructures in times of significant wet weather events. The two types of systems operate with significantly different basic assumptions and perform in very different ways to produce very different results, and the solutions to their problems are not analogous art to each other. Solutions for CSO-type systems assume the acceptability of direct disposal of overflow waste into a receiving body of water without treatment when the system is strained by excessive wet weather. However, prior art MS4-type solutions instead assumes that diversion to the sewer system during dry weather is a solution to treating municipal wastewater pollution. These systems are typically placed in different parts of the country that have different weather and therefore different needs (See Wilson, generally.)

Applicant further asserts that neither Ghalib, nor any prior art of record, teaches, suggests or motivates an upstream disinfection system located in-line to a plurality of catch basins of an MS4-type of stormwater management infrastructure, as described in at least [0029] and [0037] of the specification, as well as Figure 3. Applicant respectfully asserts that the disinfecting system of Ghalib teaches a solution of a diversion for a CSO-type system, noting its field of invention ("systems and methods for treating excess wastewater from a sewer system, such as a combined sewer system or a sanitary sewer system"), its basic design and other limitations described in the patent. On the other hand, the claimed system treats water runoff in an MS4-type system, before it enters a sewer system, a diversion, or is directly released into a body of water. By treating at the entrance to the system, instead of treating only at the end of the process when overflow occurs in a CSO-type, as in Ghalib, the present invention overcomes numerous disadvantages of the prior art, as described in the specification at least at [0004]-[0009]. The amended claims as present herein are limited to an MS4-type system. Furthermore, the claimed system comprises disinfecting chemical dispensers located in-line to a plurality of catch basins, not a singular massive structure located adjacent to a receiving body of water as in Ghalib. (Col. 3:60-63). The invention as claimed solves the problem of releasing untreated water runoff into a receiving body of water in present wet *and* dry weather storm water management infrastructure systems by treating the water runoff as it enters the infrastructure at the catch basin, instead of only when, as in Ghalib, the flow has already exceeded the capacity of a dry weather system ("wastewater will flow over a weir 44 in diversion chamber 13 and into influent passage 14.") (Ghalib, Col. 4:6-7.) This is a significant improvement in the art, as it greatly reduces the cost of

a solution to runoff treatment compared to the significant infrastructure cost of a system such as Ghalib.

The invention as claimed further differs from the cited prior art because it does not alter the flow of water to be treated, nor does it pre-treat the runoff. The invention as claimed operates as a chamberless water treatment system installed in-line to a plurality of catch basins. (See at least [0032], [0035]-[0036] and [0058].) The water flowing through a traditional MS4-type sewer system is not retained or collected and flows freely through the system, and may or may not be treated at the system's outlet, where it discharges into a public water way or other receiving body of water. (See Wilson, *supra*.) Treating water runoff that is free flowing through a chamberless system is novel and non-obvious improvement over Ghalib, Putz, O'Leary and Brown. Ghalib even teaches away from a chamberless system by requiring at least one shaft 16, divided by divider 24 into chambers 20 and 22. Ghalib further teaches shaft 16 having a diameter of 10 to 200 feet. While Applicant acknowledges Examiner's citation of *In re Lindberg* that portability alone is not patentable without a new or unexpected result, Applicant respectfully points out that a disinfection system that can be installed in a plurality of catch basins is not analogous to a system requiring a 10-200 ft diameter shaft. Furthermore, Ghalib teaches that additional shafts may improve the performance of its system:

may include one or more additional first containers, such as additional shaft structures 16', that are in inhibitable fluid communication with the tunnel 18'. While Figure 8 shows only two additional shaft structures 16', the treatment system 10 may include any suitable number of additional shaft structures 16', *such as three to twenty additional shaft structures 16'*.

Ghalib, Col. 6:46-59, (emphasis added). Also, see at least Ghalib Fig. 8 and abstract. Putz and O'Leary also teach chambered systems, as explained below. Thus, the invention as claimed is novel and non-obvious over Ghalib in view of Putz and O'Leary.

In View of Putz

The cited prior art of Putz fails to teach the claimed chamberless wet and dry weather water disinfection system installable in a catch basin of an MS4-type stormwater management infrastructure. Putz appears to teach a "rain barrel"-type system that teaches the input of industrial water to the invention for treatment for household use. To achieve the level of purity required for household use, Putz appears to require that the storm water be contained, and in its

preferred embodiment requires three containers for treatment of the storm water. "Even though the apparatus for processing rain water and/or surface water can consist basically of only one container or more than two containers, two or three containers are used in the following preferred exemplary embodiments"; Col. 3, lines 19-23. In addition, Putz teaches "[a] processing arrangement for treating the water to be processed consists basically of storage containers which, for example, can be installed under the first container..."; Col. 4, lines 40-44). The water in Putz is not treated as it flows through a catch basin into an MS4-type stormwater management infrastructure.

Further, Putz does not teach altering the amount of disinfectant based on flow rate through a storm water management infrastructure as determined by water pollution characteristics as detected by a sensor and a means to measure water flow rate, because the invention of Putz stores the water to be treated in a container, and determines treatment dosage based on the type, location, amount, use and storage time of the water in the container. See, for example:

the circulation can be switched off since the water contained in the lowest section 14 does not require processing or treatment. It becomes contaminated only after it has been standing for several days (such as, for example, during vacation time). It is possible to activate the circulation automatically for a short period of time under conditions of "zero consumption of industrial water" and to undertake a water treatment in the lowest section 14 of the first container after a certain time or completely eliminate the same.

Putz, Col. 5, lines 55-65.

The system of Putz is clearly a treatment system for water to be stored for later household use, not storm water runoff entering an MS4-type sewer system for discharge into a receiving body of water, as in the invention as claimed. The system taught by Putz is not analogous to the invention as claimed because it differs significantly in purpose, structure, way and means of effecting disinfection of water runoff. Furthermore, unlike Putz, the invention as claimed does not require a supply of industrial drinking water (Col. 5, line 13), three containers (col. 3, lines 19-23), or pumps to prevent backflow (Col. 4, line 49). In fact, when rain/surface water is processed by the invention of Putz, it is clearly called out as remaining segregated and untreated for "garden use" (Col. 7, line 55-56). The teachings of Putz are clearly related to non-analogous art.

Finally, neither Putz nor Ghalib teach both a flow rate monitor means and a water pollution sensor informationally coupled to a control unit for controlling the dispensing of a disinfecting chemical to avoid overdosing. The water pollution sensor of the invention as claimed provides input to the control unit to assist in controlling the amount of disinfecting chemical to inject into the runoff water. (See at least [0032].)

Thus, the invention as claimed, as amended herein, is novel and non-obvious over the teachings of Putz and Ghalib, both alone and in combination.

Other Dependent Claims

Claims 54, 55, 64, 66-69 and 71-73 depend from and are further limitations of amended independent Claims 21 and 61, and are therefore allowable over the cited prior art for at least the reasons stated above.

In View of O'Leary: Claims 76-77

The Examiner has further rejected claims 76 and 77 under 35 U.S.C. §103(a) as being obvious over Putz in view of US Patent No. 4,659,459 ("O'Leary"). Applicant has amended claims 76 and 77, rendering the Examiner's rejection moot as to those claims. However, in the interest of advancing the application, Applicant asserts that neither Putz nor O'Leary teach, suggest or motivate the claims as amended, because they neither alone nor together teach at least a chamberless treatment system.

Within the invention as claimed, which is usable in a plurality of catch basins of a MS4-type sewer system, flowing water is not retained or collected but flows freely through the chamberless system, mixing with the disinfectant in a region of the MS4 conduit while being treated, to the system's outlet where it discharges into a public water way or other receiving body of water. (See at least [0032].) O'Leary requires a chamber, and must compute the volumetric capacity of the chamber in which it treats the water to determine a proper amount of disinfectant chemical to add to the water. (See at least Abstract, Figs. 1, 3, Col. 2:41-45, Col. 4:24-31, Col. 6:29-34.) All independent claims as herein amended are limited to chamberless operation in MS4-type sewer systems.

Furthermore, O'Leary and teaches away from treating water in a turbulent flow. (See

Col. 13:35-46.) The invention as claimed is limited to use in an MS4-type sewer system that is a well-known further limitation of a storm water management infrastructure. (See Wilson, *supra*, generally.) Such systems regularly exhibit turbulent flow. Thus, the system of O'Leary is not appropriate for use in an MS4-type sewer system.

Thus, as asserted above, both Putz and O'Leary teach solutions requiring chambering of the water to be treated where the chamber is a critical element to achieve the proper dosage of chemicals to cause disinfection. (See the discussion of Putz, *supra*.)

The invention as claimed differs from O'Leary at least because O'Leary teaches measuring the velocity of the chemicals being introduced to the water being treated to determine the correct amount of chemicals to continue to add to the runoff water for proper treatment, as in a traditional water tower system. (Col. 3:25-27, O'Leary.) The invention as claimed instead measures the flow rate of water through a catch basin of an MS4-type system to determine the amount of disinfecting chemical to add to the water, as well as using input from a water pollution sensor located upstream and/or downstream from the chemical dispenser. (See at least [0036], [0039].)

In summary, neither Putz nor O'Leary are installable in a catch basin, both have chambers or containers for holding the water to be treated, and O'Leary measures the velocity of the disinfect to determine the amount to add, instead of measuring the flow rate and water pollution characteristics. On the other hand, the invention as claimed operates in a chamberless system of an MS4-type sewer using flow rate of the water into a catch basin. Thus, Putz and O'Leary are non-analogous art. Finally, neither Putz nor O'Leary teaches a water pollution sensor coupled to a control unit for controlling the dispensing of a disinfecting chemical to avoid overdosing the water runoff with treatment chemicals. (See at least claims 76, 77 and [0032].) Thus, the present invention is novel and non-obvious over the teachings of Putz and O'Leary, both alone and in combination.

Ghalib In View of Putz and O'Leary: Dependent Claims 55 and 70

The Examiner has further rejected claims 55 and 70 under 35 U.S.C. §103(a) as being obvious over Ghalib in view of Putz and applied to claims 21 and 61, and in view of O'Leary.

Claims 55 and 70 depend from and are further limitations of amended independent Claims 21 and 61. Applicant has addressed the non-obviousness of claims 21 and 61 in view of Ghalib, Putz and O'Leary above, and asserts that the dependent relationship of claims 55 and 70 to those claims render them allowable over the cited prior art for at least those reasons.

In View of Brown: Dependent Claim 65

Finally, the Examiner has rejected claim 65 under 35 U.S.C. §103(a) as being obvious over Ghalib in view of Putz and further in view of US Patent Publication No. 2003/0030011 ("Brown"). Claim 65 depends from and is a further limitation of amended independent claim 61. Applicant has addressed the non-obviousness of independent claim 61 in view of Ghalib and Putz above. Therefore, Applicant here asserts that the dependent relationship of claim 65 to claim 21 renders it allowable over that art for at least those reasons.

Summary

Applicant respectfully submits that Ghalib, neither alone nor in combination with Putz, O'Leary, Brown or other prior art of record teaches, suggests or discloses a wet and dry weather water disinfection system for reducing harmful pathogens found in water runoff entering a municipal separate storm sewer system-type stormwater management infrastructure comprising: a plurality of catch basins, each said catch basin flowingly coupled to a municipal separate storm sewer system, each said catch basin comprising a storm sewer inlet configured to accept and direct water from a street to a receiving body of water through said municipal separate storm sewer system; a plurality of disinfecting chemical dispensers, each located in-line to one of said catch basins, wherein each said disinfecting chemical dispenser is configured to introduce a disinfectant chemical directly into said water flowing through said storm sewer inlet such that said disinfecting chemical mixes with said water in a chamberless region of said catch basin, said disinfectant chemical capable of reducing harmful pathogens in said water; a water pollution sensor configured to measure water pollution characteristics attributable to said water flowing through said storm sewer inlet; a means to measure water flow rate attributable to said water flowing through said storm sewer inlet; and a control unit informationally coupled to said disinfecting chemical dispenser, said water pollution sensor and said flow rate measurement means, said control unit configured to control an amount of said disinfectant chemical added by

said disinfecting chemical dispenser to said water flowing through said storm sewer inlet to said receiving body of water as determined by a flow rate of said water through said storm sewer inlet as detected by said flow rate measurement means, and said amount of said disinfecting chemical further determined by water pollution characteristics of said water as detected by said water pollution sensor.

Applicant further respectfully submits that Ghalib, neither alone nor in combination with Putz, O'Leary, Brown or other prior art of record teaches, suggests or discloses an automated in-line storm water disinfection system for reducing harmful pathogens in wet and dry weather water runoff in a municipal separate storm sewer system-type stormwater management infrastructure comprising: a monitor for measuring flow rate of water runoff through a municipal separate storm sewer system, whereby said flow rate can be measured for both wet and dry weather storm water runoff; a chamberless means for disinfecting said water runoff; a control unit located in-line to said municipal separate storm sewer system and informationally coupled to said flow rate monitor and said disinfecting means, and capable of causing said disinfecting means to dispense disinfectant into said water runoff in a dosage adjusted for said measured flow rate, for purposes of reducing harmful pathogens in said water runoff; and at least one sensor coupled to said control unit for measuring water pollution characteristics attributable to said water runoff and providing input to a process model used by said control unit.

Applicant further respectfully submits that Ghalib, neither alone nor in combination with Putz, O'Leary, Brown or other prior art of record teaches, suggests or discloses an automated in-line wet and dry weather water flow disinfection system for disinfecting storm water runoff in a municipal separate storm sewer system-type stormwater management infrastructure comprising: an in-line flow rate monitor for measuring flow rate of water runoff through at least one catch basin of a municipal separate storm sewer system; a chamberless water treatment unit comprising a chemical dispenser for dispensing at least one disinfectant chemical into said water runoff; a control unit located in-line to said municipal separate storm sewer system and electrically coupled to said flow rate monitor, said control unit further coupled to said chemical dispenser and capable of controlling an amount of said chemical disinfectant applied to said water runoff; at least one upstream sensor feedback coupled to said control unit to provide feedback to said control unit regarding pre-treatment biological properties of said water runoff;

at least one downstream sensor feedback coupled to said control unit to provide feedback to said control unit as to post-treatment biological properties of said disinfected water runoff; and said control unit further programmed to automatically determining a dosage level of said chemical disinfectant based on said flow rate, input from said upstream sensor and input from said downstream sensor.

Claims 54, 55, 64-73, and 77 depend from and are further limitations of amended independent Claims 21, 61 and 76, and are therefore allowable over the cited prior art for at least the reasons stated above.

Conclusion

Claims 21, 54, 55, 61, 64-73, and 76-77 are pending in the present applicant. Claims 21, 61 and 76 are independent claims. Applicant asserts that the claims as presented herein are patentable over the cited prior art for at least the reasons stated herein and are therefore in condition for allowance. Applicant respectfully requests a timely Notice of Allowance for the claims in this case.

Respectfully submitted,

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